

**IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK  
MANHATTAN DIVISION**

**VIRTUAL SOLUTIONS, LLC,**

Plaintiff,

v.

**MICROSOFT CORP.,**

Defendant.

Case No. 12-CV-1118 (SAS)

---

**DECLARATION OF VYACHESLAV (“SLAVA”) ZAVADSKY, PH.D.**

I, Vyacheslav (“Slava”) Zavadsky, Ph.D., declare as follows:

1. I make this declaration at the request of Virtual Solutions, LLC in support of Virtual Solutions’ response to Defendant Microsoft’s motion for summary judgment of invalidity for indefiniteness and in response to the Declaration of Aaron Bobick, Ph.D. If called to testify as to the contents of this declaration I would testify competently thereto.

2. My educational background, qualifications, and professional experience are set forth in Exhibit A attached hereto.

3. I received a Masters in Computer Science in 1994 from Belarusian State University. I received a Ph.D. in 1998 from Belarusian State University. Currently I am the Principal of Zavadsky Technologies, where my practice focuses on patent assessment, software project management, development and consulting. I have taught at Carleton University (Ottawa, CA), Belarusian State University (Minsk, Belarus), and the Belarusian Ministry of Education (Belarus).

4. Over the last twenty-five years I have developed extensive experience in several aspects of computer science and software and hardware development including algorithms and engines for image/video processing and compression, gaming, rendering engines, graphics,

gaming consoles and computer vision. I am the named inventor on 12 issued United States patents and have 10 additional patents pending. At least 5 of these issued patents pertain to image processing and computer vision. I also worked for 9 years for UMB TechInsights (formerly Semiconductor Insights) doing patent analysis and reverse engineering. During these years I reviewed hundreds of patents.

5. I have reviewed U.S. Patent No. 6,507,353 (“the ‘353 patent”), which I understand is the patent-in-suit in this case. I have also reviewed the file history for the ‘353 patent. In addition, I have reviewed Microsoft’s Motion for Summary Judgment of Invalidity for Indefiniteness, as well as the Exhibits corresponding to this motion including the Declaration of Dr. Aaron Bobick.

6. In my opinion, the relevant field pertaining to the ‘353 patent is computer science in general and computer user interfaces and games in particular as applied to interactive virtual reality systems and human activity sensing.

7. I understand that Dr. Bobick believes a person of ordinary skill as of December 10, 1999, the filing date of the ‘353 patent, would possess “at least a Master’s degree in computer science or electrical engineering with several years of experience in the design of sensing and interactive virtual reality systems. One who possessed extraordinary experience in one of these areas could also be considered to have ordinary skill in the field, notwithstanding a deficit in the other area.” I meet this definition and possess at least the ordinary level of skill in the relevant area both today and as of December 10, 1999, the date the ‘353 patent was filed.

8. It is my understanding that Virtual Solutions has asserted claim 1, 2, 3, 5, 7, 8, 9 and 22 in this case. My review of the ‘353 patent was not limited to the asserted claims. Rather, I reviewed the entirety of the patent, and the file history, including all claims.

9. Claim 1 of the '353 patent contains the limitation "physical characteristic signal." Specifically, claim 1 states "interpreting said sensor signals to provide at least one physical characteristic signal including position information." In addition, claim 1 states "to generate a behavior vector of said at least one virtual actor using said position information and said at least one physical characteristic signal."

10. In addition to claim 1, claims 10, 11, 13, 14, 15 and 18 also independently contain the term "physical characteristic signal."

11. In addition to claim 1, claims 10, 13 and 15 independently contain the terms "physical characteristic signal" and "position information."

12. Claim 8 contains the limitation "virtual environment stimulus generator." Specifically, claim 8 requires "a step of providing a virtual environment stimulus generator wherein said virtual environment stimulus generator analyzes said virtual environment database and generates a virtual environment stimulus."

13. Based on my review of the materials in this matter and my experience and qualifications I feel qualified to render an opinion concerning the limitations "physical characteristic signal," "position information," and "virtual environment stimulus generator," including addressing Dr. Bobick's opinions concerning these limitations.

## **II. "PHYSICAL CHARACTERISTIC SIGNAL"**

14. I understand that Dr. Bobick, in support of Microsoft's position in this matter, has opined that the term "physical characteristic signal" is insolubly ambiguous. I disagree with Dr. Bobick's conclusion and his reasoning.

15. I note that Dr. Bobick's conclusion regarding the term "physical characteristic signal" appears to be devoid of sufficient analysis. Dr. Bobick appears to have merely reviewed

claim 1 of the '353 patent and concluded that contradictory language exists and that the claim is therefore insolubly ambiguous. In my opinion, this conclusion is contrary to the claim language itself as well as the language of the '353 patent.

16. I agree with Dr. Bobick that the language of claim 1 requires "at least one physical characteristic signal including position information." I further agree that claim 1 requires that a behavior vector be generated "using said position information and said at least one physical characteristic signal." I disagree, however, that these statements are contradictory or that claim 1 mandates that "position information" be distinct from the position information included in the "physical characteristic signal."

17. "Position information" is data that pertains to the position of the visitor or user of the interactive environment. There are numerous references throughout the '353 patent that support this conclusion. For example, Table 1 titled "Example of a Calibration Table" contains Positional information from Sensor C, indicating that "position information" is data. '353 patent, column 11, Table 1. The SensorData class 87, the PhysicalSensorData class 91 and the VirtualSensorData class 93 all contain the method getData( ) 88. '353 patent, column 11, lines 36-49. This is also shown in Figures 8 and 10. The term "position information" is merely data pertaining to the position of the visitor, or user, of the virtual environment that is obtained by one or more sensors and then stored for future use.

18. Dr. Bobick's conclusion appears to be premised on the belief that the "position information," or data, can only be a part of a single data structure in the claimed invention, and that using the same data in multiple data structures is not allowed. In other words, Dr. Bobick appears to reason that because the "physical characteristic signal" includes "position information," the "position information" cannot also be used apart from the "physical

characteristic signal” (which also includes the position information), such as to aid in the generation of the behavior vector. This is contrary to the teachings of the ‘353 patent.

19. Figures 2 and 3 demonstrate that “position information” obtained from the positional sensor 21, 46 is provided to the positional stimulus generator 24, 49, which then provides the information to the behavioral module 28, 58, 68. In addition, Figures 8 and 10 demonstrate that “position information” can be provided from the SensorData class 87 to both the PhysicalSensorData class 91, the VirtualSensorData class 93, as well as the StimuliGenerator class 89.

20. Figure 4 demonstrates another manner in which the “position information” may be used in the claimed invention. As shown in Figure 4, the plurality of sensors 65, which include the positional sensor 48, transmit a sensor signal to interpreter 66. This signal will contain the “position information.” The interpreter then uses this information, including the “position information” to generate the “physical characteristic signal including position information.” The “physical characteristic signal including the position information” is then transmitted to the analyzer 67 to generate the behavior vector. ‘353 patent, Figure 4 and column 7, lines 5-10.

21. However, the analyzer 67 also uses information from the behavioral module, or behavior model 68 to generate the behavior vector. As discussed in paragraph 19, Figure 3 demonstrates that the “position information” is also provided to the behavioral module 58, 68. As such, it is possible for the analyzer to use both the “physical characteristic signal including position information” and “position information” obtained from the behavioral module 58, 68 to generate the behavior vector. This is precisely what is disclosed in the patent specification and claimed in claim 1.

22. Several other dependent claims in the '353 patent also highlight that the “position information” does not have to only be included in the “physical characteristic signal.” For example, claim 10 indicates that the new actor creation module creates a new actor using “said at least one physical characteristic signal, said behavior model and said position information.” Claims 13 and 15 require adding a reaction for the physical characteristic signal using “said behavior model and said position information.”

23. It is my opinion that the specification of the patent suggests implementing software code for the invention using well known and understood in the art OOP (Object Oriented Programming) techniques. Various classes (objects are known in the art as instances of classes) are described, for example, in Figures 10-13.

24. In particular, element 91 of Figure 10 provides for a class PhysicalSensorData, that is derived from the class SensorData (element 87 of Figure 10). Description of Spatial module and specifically Calibration table in column 11, lines 14-45 is a clear indication that at least some of the sensor data (sonic, positional) can be used to calculate a visitor's position. PhysicalSensorData is associated with StimuliGenerator (see element 89 of Figure 10) that is in turn associated with Stimulus (see element 95 of Figure 10) and Animal (see box 100 in Figure 11).

25. Having many years of experience implementing OOP systems, I know that the data (such as sensor data stored in the fields Value0-Value2 of SensorData and returned by getData (see elements 87, 91, 88 of Figure 10)) and position data stored in the field Position of Stimulus (see element 95 of Figure 10)) are normally copied in many objects and intermediate data. The reasons for such copying may include: establishing a local copy for faster access, providing standardized ways to access data (*see e.g.* method getData 88 in Figure 10), scaling

sensor data to a common calibrated scale (*see, e.g.* column 11, lines 20-30), converting position information to different coordinate systems (*e.g.*, from relative to a specific sensor to a global coordinate system to a coordinate system related to a specific animal). Such copying and transformations are routinely performed by programmers as needed.

26. One of ordinary skill in the art, such as myself, having reviewed the entirety of the ‘353 patent, including its file history, would understand that “position information” is data that can be used as part of the physical characteristic signal, or it could be copied and/or transformed and used as a part of the behavioral module, or on its own.

27. The term “physical characteristic signal” does not cause the claims of the ‘353 patent to be insolubly ambiguous or present a logical contradiction. Rather, as detailed in the preceding paragraphs, one of ordinary skill in the art, such as myself, having reviewed the ‘353 patent, would be able to understand the bounds of the claims when read in light of the specification.

### **III. “VIRTUAL ENVIRONMENT STIMULUS GENERATOR”**

28. Claim 8 of the ‘353 patent requires “providing a virtual environment stimulus generator wherein said virtual environment stimulus generator analyzes said virtual environment database and generates a virtual environment stimulus.”

29. I understand that Dr. Bobick, in support of Microsoft’s position in this matter, has opined that the ‘353 patent does not disclose sufficient structure that corresponds to the term “virtual environment stimulus generator” to ascertain what the claim means. I disagree with Dr. Bobick’s conclusion and his reasoning.

30. In my opinion, as one of ordinary skill in the art, claim 8 alone recites sufficient structure to ascertain what the claim means. I disagree with Dr. Bobick’s opinion that the term

“virtual environment stimulus generator” describes only a function as is not a well-known term in the art that connotes structure.

31. The term generator, in the context of computer related technologies such as those described in the ‘353 patent, is commonly understood as connoting structure and, specifically, a program, routine or subroutine. Based on my review, there are at least three dictionary definitions for the term “generator” which all highlight that it is understood as a structural term in the context of computer related technologies, as set forth below:

- A program that produces a particular type of output on demand, as random numbers, an application program, or a report. Dictionary.com, “generator,” in *Dictionary.com’s 21<sup>st</sup> Century Lexicon*, <http://dictionary.reference.com/browse/generator>.
- A routine that constructs other routines or subroutines using given parameters, for specific applications. Oxford Dictionary, “generator,” (2012), <http://oxforddictionaries.com/definition/english/generator?q=generator>.
- A program that produces specific programs from the definition of an operation. The American Heritage Dictionary of the English Language, “generator,” 4<sup>th</sup> Edition (2009).

32. As such, Dr. Bobick’s conclusion that the term “generator” does not connote structure is misplaced.

33. In addition, the term “virtual environment” has a well understood meaning in the context of computer related technologies. Based on my review, there is at least one dictionary definition that defines the term “virtual environment” in the context of computer related technologies, as set forth below:

- A computer-generated, three-dimensional representation of a setting in which the user of the technology perceives themselves to be and within which interaction takes place. Dictionary.com, “virtual environment,” in *Dictionary.com’s 21<sup>st</sup> Century Lexicon*, [http://dictionary.reference.com/browse/virtual\\_environment](http://dictionary.reference.com/browse/virtual_environment).

Moreover, Wikipedia defines the terms “virtual environment” and “virtual reality” as follows:



- Virtual reality (VR) is a term that applies to computer-simulated environments that can simulate physical presence in places in the real world, as well as in imaginary worlds. [http://en.wikipedia.org/wiki/Virtual\\_environment](http://en.wikipedia.org/wiki/Virtual_environment).

34. Parsing the phrase, a “virtual environment stimulus generator” is a generator in a virtual environment that generates a stimulus in the virtual environment. As detailed in the preceding paragraphs, the terms virtual environment and generator have a well understood structural connotation in the context of computer related technologies.

35. Based on the language in claim 8, it is my understanding that the virtual environment stimulus generator has to: (1) analyze the virtual environment database; and (2) generate a virtual environment stimulus. In my opinion, the term “virtual environment stimulus generator,” standing alone without reference to the ‘353 patent specification, connotes sufficient structure, as detailed in the preceding paragraphs, to allow one of ordinary skill in the art, such as myself, to ascertain what claim 8 means.

36. It is also my opinion that the term “virtual environment stimulus generator,” including the terms “virtual environment” and “generator,” are not generic structural terms such as “mechanism,” “device,” or “element.” Rather, as detailed in the preceding paragraphs, these are specific structural terms that have an understood meaning in the context of computer related technologies such as those discussed in the ‘353 patent, including claim 8.

37. Having reviewed Dr. Bobick’s declaration I understand him to concede that, based on his review of claim 8 and his knowledge of the relevant art area, one of ordinary skill in the art would be familiar with numerous ways to (1) analyze the virtual environment database; and (2) generate a virtual environment stimulus. *See* Bobick Declaration, paragraphs 17 and 18.

38. Based on this, I understand Dr. Bobick to be conceding that, at a minimum, claim 8 provides a sufficient recitation of structure and sufficient clarity to allow him to know of a

broad class of structures that could be used to (1) analyze the virtual environment database; and (2) generate a virtual environment stimulus.

39. In addition to the structure recited in claim 8, which in my opinion is alone sufficient to allow one of ordinary skill, such as myself, to ascertain what the claim means, the ‘353 patent specification contains voluminous references elaborating on the structure that corresponds to the “virtual environment stimulus generator.”

40. For example, Figure 2 and its corresponding description indicates that virtual environment stimulus generator 27 reads information from the virtual environment database 26 in order to calculate the occurrence of random events such as the apparition of new actors. Once the virtual environment stimulus generator 27 decides that a new actor should be created, it then sends a signal to the new actor creation module 29. ‘353 patent, Figure 2, column 3, lines 61-67.

41. In addition, Figure 3 and its corresponding description indicates that virtual environment stimulus generator 52 can not only compute random events and create new actors, but can also generate a reaction using the reaction generator 56. ‘353 patent, Figure 3, column 6, lines 33-42.

42. I disagree with Dr. Bobick that Figures 2 and 3 and their corresponding descriptions do not recite further structure that corresponds to the virtual environment stimulus generator. In my opinion, Figures 2 and 3 and their corresponding descriptions disclose an algorithm, via prose and flow chart, that reads information from the virtual environment database, analyzes that information, and then based on that analysis can send a signal for the creation of a new actor or send a signal to the reaction generator to generate a reaction.

43. An additional flaw in Dr. Bobick’s analysis is that it appears to end after his review of Figures 2 and 3 and their corresponding descriptions. Further in the ‘353 patent

specification additional structure corresponding to the “virtual environment stimulus generator” is identified including the StimuliGenerator class 89, which includes a SensorTable containing sensor data and the methods CalcStimuli ( ) 90 and GetStimuliData ( ) 92. This is a specific computer class and methods that can be utilized to implement the “virtual environment stimulus generator.” ‘353 patent, Figures 8, 10, 11, column 11, lines 50-57.

44. In addition, as I explained before, the specification is explained in terms of OOP (Object Oriented Programming). At lines 50-57 of column 11, the specification describes class StimuliGenerator that is further depicted as element 89 in Figures 10 and 11. Methods CalcStimuli ( ) and GetStimuliData ( ) are shown. Based on my review of the specification, it is my opinion that at least the following embodiment of “virtual environment stimulus generator” is recited: (a) virtual environment stimulus generator is either an instance of StimuliGenerator, or instance of a class derived from stimulus generator; (b) virtual environment stimulus generator implements methods CalcStimuli ( ) and GetStimuliData ( ); (c) virtual environment stimulus generator relies on sensor data (see Fig. 10) and information of the current state of the virtual world (see Figure 13). One skilled in the art would be able to take this information and develop a working system.

45. In addition, an example calculation of a virtual actor’s reaction, using stimuli provided by the virtual or physical world and calculated by the Class StimuliGenerator is set forth from column 13, line 40 to column 15, line 50.

46. In summary, it is my opinion that claim 8 alone recites sufficient structure to allow one of ordinary skill in the art, such as myself, to readily ascertain the meaning of the claim. In addition, numerous excerpts throughout the ‘353 patent connote additional structure

that corresponds the “virtual environment stimulus generator” that would further allow one of ordinary skill in the art, such as myself, to ascertain the meaning of claim 8.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct.

DATED: November \_16\_, 2012



Vyacheslav

---

Vyacheslav Zavodsky, Ph. D.